

REMARKS

Drawing Corrections

The attached Figures 1 through 13B are identical to originally filed Figures 1 through 13B except for corrections required by the Official Draftsman. Original Figures 1 through 13B were objected to by the Official Draftsman on the basis of nonconforming margins; and lines, numbers, and letters not being uniformly thick. The Examiner is respectfully requested to approve the attached Figures 1 through 13B, submitted by letter to the Official Draftsman.

Support for Amendments

Support for the change to the Specification at page 25 at the lines numbered 10 and 11 can be found at least in the Summary of the Invention at the end of page 2 to the beginning of page 3, in the Specification at page 4 at the lines numbered 5-16, referring to the schematic of the laser system described in connection with Figure 1, and in the Specification at page 12.

The amendment to the Specification at page 25 at the line numbered 24 restates the laser induced breakdown (LIB) of the invention to re-emphasize matter already present in the Specification so as to render the Specification even more useful as a teaching tool. Support for the amendment to the Specification made at page 25 at the line numbered 24 can be found as follows.

"Ionization" is discussed at least at page 20 at the lines numbered 13-21, at page 21 at the line numbered 2, at page 23 at the lines numbered 6-24, and at page 25 at the lines numbered 6-25.

Support for "free electron" and "free electron multiplication" can be found at least at page 20 at the lines numbered 13-15, at page 21 at the lines numbered 10-11, at page 23 at the lines numbered 6-12, at page 24 at the lines numbered 6-24, and page 25 at the lines numbered 6-24.

"Dielectric breakdown" can be found at least at page 20 at the lines numbered 13-21 and at page 25 at the lines numbered 6-7.

Support for "plasma formation" can be found in the Specification at least at page 17 at the lines numbered 7-9, at the lines numbered 19-22, and at the lines numbered 22-24.

Support for "thermal-physical changes in state" can be found at page 22 at the lines numbered 8-10, at page 23 at the lines numbered 13-21, at page 24 at the lines numbered 7-12, and at page 25 at the lines numbered 6-24.

Support for "changes in state such as melting and vaporization leading to an irreversible change" can be found at page 20 at the lines numbered 8-12, at page 23 at the lines numbered 6-24, and at page 25 at the lines numbered 6-24.

Support for the use of the term "characteristic" in claim 1, in connection with the rapid and distinct change in slope, can be found at least in the Specification at page 11, lines 4 through 10 and in the claims as filed.

Support for the use of the term "radiation" in claim 5 can be found in the Specification at least at page 20 at the line numbered 8.

Support for the use of the term "proportional" in claim 7 can be found in the Specification at least at page 3 at the lines numbered 16 and 27.

Support in the Specification for the changes to claims 13, 14, 24, 25, 32, and 33 can be found as herein described above with respect to the addition to the Specification at page 25 at the line numbered 24.

Support for the changes to claims 21 and 29 including those to correct grammatical/syntactical errors can be found in the Specification at least in connection with the description of Figure 1, Examples 1 and 2, the Summary of the Invention beginning at the bottom of page 2 and continuing to the top of page 3, and the claims as filed.

Rejection of Claims Under 35 U.S.C. §112 and Objection

It is respectfully requested that the rejection to claims 2, 5, and 7 under 35 U.S.C. §112, second paragraph, be withdrawn on the basis of corrections made.

Claim 37 was objected to as being in improper form. To correct this the term "or" replaces "and" in the preamble. Accordingly, treatment of this claim on the merits is now respectfully requested.

Rejection of claims 1 through 5, 8 through 17, and 39 under 35 U.S.C. §102(b)

Claims 1 through 5, 8 through 17, and 39 were rejected under 35 U.S.C. §102(b) as being anticipated by Miyauchi et al., U.S. Patent No. 5,208,437.

Although not expressly so stated, the rejection on the basis of Miyauchi may be based on alleged inherency. A review of Miyauchi does not reveal a teaching of the key feature of the present invention whereby "a relationship of fluence breakdown threshold versus laser pulse width exhibits a rapid and distinct change in slope at a predetermined or characteristic pulse width". It is axiomatic that, in order to "anticipate" a claim, "all the elements in the claim (or possibly their equivalents . . .) must have been disclosed in a single prior art reference or device." Radio Steel & Mfg. Co. v. MTD Products, Inc., 731 F.2d 840, 845, 221 USPQ 657, 661 (Fed. Cir. 1984). Moreover, "it is incumbent upon the Examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference." Ex parte Levy, 17 USPQ2d 1461, 1462 (BPAI 1990). It appears that the rejection may be based upon the assumption that the material involved in Miyauchi inherently exhibits such a characteristic and that the pulse width employed in Miyauchi are inherently less than this pulse width.

First, there is no teaching in Miyauchi of the characteristic in question, therefore, there is nothing "predetermined" or "characteristic" about the critical pulse width. Second, the pulse widths employed in Miyauchi are not in fact less than the critical pulse width. Miyauchi proposes to employ pulse widths in the range of 100-300 picoseconds for lasing metal (Al) (Column 2 at line 58), Miyauchi's pulse widths are considerably greater than the pulse widths required by the method of the present application for metal (Au) about 10 picoseconds or less. (See arrow, Figure 3 of the application). Third, Miyauchi states that the peak power required for cutting is inversely proportional to the square root of pulse width. (See Miyauchi at Column 2 at line 30.) Accordingly, Miyauchi shows that the threshold for damage is

proportional to the square root of pulse width. This is exactly what the present application demonstrates is not the case.

The present application demonstrates that in a particular operating range, approximately 10 picoseconds or less, there is a breakpoint in the slope of the laser induced breakdown threshold. By the method of the present invention, ablation is accomplished in the range of pulse width less than the breakpoint. In contrast, Miyauchi et al. did not have an understanding of breakdown in this important, critical range. In short, the pulse widths disclosed in Miyauchi are greater than those described by the present application at the change of slope point. For material of the type described in Miyauchi, the slope change occurs at less than 10 picoseconds whereas Miyauchi operates in the range of 100-300 picoseconds, completely missing the important feature of the invention. Miyauchi adheres to the old thinking that the scaling law should be followed throughout the operating range. Therefore, based on Miyauchi one would not be able to project that an optimal range pulse width is identifiable as in the present invention. Therefore, the old thinking exemplified by Miyauchi et al. is surprisingly disproved by the present invention.

In summary, Miyauchi does not employ pulse widths that are inherently less than the "predetermined pulse width" as defined in the preamble of claim 1 as filed. Miyauchi does not employ pulse widths that are inherently less than the "characteristic pulse width" as defined in claim 1 as now amended. In that regard, it appears that the Office Action analysis overlooks the preamble which gives meaning to the claim and is essential to a key feature of the invention. Such a preamble cannot be overlooked, especially when step (a) of claim 1 as filed referred to "said predetermined pulse width"; and claim 1 as amended refers to "said characteristic pulse width". In determining anticipation, functional language,

preambles, and language in "whereby," "thereby," and "adapted to" clauses cannot be disregarded. (See Porter v. Farmers Supply Service, Inc., 790 F.2d 882, 229 U.S.P.Q. 814, 816 (Fed. Cir. 1986); and Pac-Tec, Inc. v. Amerace Corp., 903 F.2d 796, 14 USPQ2d 1871 (Fed. Cir. 1990). Therefore, Miyauchi cannot anticipate the invention of claims 1 through 5, 8 through 17, and 39. New claim 40 is not anticipated by Miyauchi for the same reasons.

Claims 1 and 6 were rejected under 35 U.S.C. 102(b) as being anticipated by Zysset et al. in the article "Picosecond Optical Breakdown: Tissue Effects and Reduction of Collateral Damage".

The above arguments relative to Miyauchi apply equally as well to Zysset. That is, the Zysset paper does not disclose the key feature of the present invention relative to the relationship of breakdown threshold versus pulse width. Once again, the basis of the rejection appears to be alleged inherency. Zysset proposes to employ a pulse width of 40 picoseconds, which is well above the critical pulse width in the various examples of the present application for the materials of interest. (See Example 3 - Tissues, present pending application pages 19-20.) Accordingly, like Miyauchi, the Zysset reference would not inherently operate as recited in claim 1. Zysset et al., used a laser source capable of producing pulses only as short as 40 picoseconds. Zysset et al., like Miyauchi, have missed the important range identified by the change in slope that is required for precision cutting and breakdown of material by the mechanisms of the present invention. Therefore, even assuming, for purposes of argument, that the materials involved in both Miyauchi and Zysset have an inherent characteristic of the type recited in the preamble of claim 1, it is clear that the operating pulse widths in the two references do not satisfy the express recitation of method step (a).

In summary, for the reasons give above with respect to Zysset and Miyauchi, Zysset cannot anticipate the invention of claims 1 and 6.

Rejection of Claims 18, 20, and 38 Under 35 U.S.C. §103

Claims 18, 20, and 38 were rejected under 35 U.S.C. §103 as being unpatentable over Miyauchi et al. in view of Kunz et al., where Miyauchi is apparently used on the basis of alleged inherency and Kunz et al. teaches using a flexible diaphragm. For the reasons described above, Miyauchi does not remotely suggest the key feature of the invention. Kunz et al. does not supply the deficiencies of Miyauchi. Therefore, Miyauchi and Kunz do not render the invention of claims 18, 20, and 38 unpatentable.

Claim 19 was rejected under 35 U.S.C. §103 as being unpatentable over Zysset et al. in view of L'Esperance, Jr. on the basis of the assumed alleged inherency and on the basis that L'Esperance teaches using a mask to control the beam shape. For the reasons described above, Zysset does not suggest the key feature of the invention. L'Esperance does not supply the deficiencies of Zysset. Therefore, Zysset and L'Esperance do not render the invention of claim 19 unpatentable.

Claims 20 and 38 were rejected under 35 U.S.C. §103 as being unpatentable over Miyauchi et al. in view of Von Allmen et al. For the reasons described above, Miyauchi does not suggest the key feature of the invention. Von Allmen does not supply the deficiencies of Miyauchi. Therefore, Miyauchi and Von Allmen do not render the invention of claims 20 and 38 unpatentable.

USSN: 08/224,961

Acknowledgement of Allowable Claims

Applicants acknowledge and appreciate that claims 21 through 36 were said in the Office Action to be allowable over the prior art of record.

Examiner is respectfully requested to allow all the pending claims, that is claims 1 through 40 and permit same to pass to issue at Examiner's earliest convenience.

In the event that this amendment does not result in allowance of all such claims, the undersigned attorney respectfully requests a telephone interview at Examiner's earliest convenience.

Respectfully submitted,

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LMD/sc  
USM 713.01

MPEP 713.01 states in part as follows:

Where the response to a first complete action includes a request for an interview or a telephone consultation to be initiated by the examiner, . . . the examiner, as soon as he or she has considered the effect of the response, should grant such request if it appears that the interview or consultation would result in expediting the case to a final action.